FOREST PRACTICES

Forest Site Management Section

Forest Practices Branch, PO Box 9518, Stn Prov. Govt, Victoria, B.C. V8W 9C2

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SILVICULTURE NOTE 8

FERTILIZATION AT TIME OF SOWING AND AT TIME OF PLANTING[1]

CURT CLARKE,[2] ROB SCAGEL,[3] ROB BOWDEN[4]

Abstract

Seven fertilization at the time of planting (FAP) and time of sowing (FAS) trials on different stock types of lodgepole pine, Douglas-fir, redcedar, and white spruce are reviewed. The trials used different rates of fertilizer, different fertilizer release characteristics, and different types of fertilizer. FAS treatments showed little growth or survival effects. FAP treatments only showed slight effects on survival and no significant differences in height growth. Only one FAP treatment in one trial significantly reduced planting check. Some FAP treatments were confounded by site effects. On some sites, FAP resulted in increased frost and browse damage.

Introduction

Over the last ten years plantation survival has improved to the point where 90% survival is the norm rather than the exception. Not only has the overall survival improved, but the variability in results has decreased. These improvements in seedling survival reflect the increasing skill and experience of nursery growers, planters, site preparation operators, prescribing silviculturists and project managers. Plantations are becoming a more reliable means of meeting regeneration requirements. However, for many species there is still concern regarding poor post-planting height-growth performance. In the worst case, poor initial height growth has been referred to as a syndrome known as "planting check." Planting check typically occurs in the second year after planting, and is characterized by short height increments with poor needle retention, those needles remaining are small and generally chlorotic. In bareroot stock, planting check may occur in the year of planting. The seedling may persist in this condition for a number of years before foliage colour returns and height increment improves. It is during this period of check, that seedlings may be damaged by animals or suppressed by surrounding vegetation, thus becoming increasingly susceptible to damage by insects and disease. Causes for this check range from poor stock quality and improper handling to cold wet soils. All are considered possible causes but none have been implicated as the dominant reason for check.

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2 B.C. Ministry of Forests, Forest Practices Branch, Victoria.

3 Pacific Phytometric Consultants, Surrey.

4 B.C. Ministry of Forests, Quesnel Forest District.

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The legislated canon of the Forest Practices Code obliges silviculturists to consider stocking, performance, and species composition for meeting free to grow requirements. Even though stocking performance requirements may be attained, the achievement of minimum heights may be delayed or missed completely because of planting check.

Many silviculturists have experimented with fertilization at the time of planting (FAP), as a way to minimize planting check. More recently, fertilization at sowing (FAS), or pre-plant nutrient charging as it is known in horticulture, has been investigated as a method of alleviating planting check. Forest Practices Branch and Research Branch have initiated research trials on FAP and FAS since the early 1980s. Brockley (1988) reviews a number of the B.C. MOF trials of FAP and FAS.

Fertilization at the Time of Planting

It has been demonstrated that FAP can be an effective practice under special circumstances such as road and landing rehab where site nutrition has been reduced (Bowden 1995; Hickling, *et al.* 1995; Scagel, *et al.* 1994). The results of FAP are often inconsistent (Brockley 1988; van den Driessche 1988). Long-term benefits are the exception rather than the rule (Scagel, *et al.* 1994; Brockley 1988; van den Driessche 1991). In addition to the inconsistency in results, FAP can also be expensive to apply. Where early height growth differences were evident, these differences have generally been transient — rarely persisting for more than the first few years.

Fertilization at Sowing

By contrast to FAP, FAS is a less expensive option. Although FAS has become widely used in forest nurseries, it has been prescribed for nursery culture rather than post-planting fertility. Prior to the early 1980s, incorporation of slow-release fertilizer into the growth media was not an operational nursery practice. The technique was designed to make up for an insufficient nutrient content of unammended, acidic, peat-based growing media and to help buffer the nutrition during nursery culture. FAS is used as a starting point in a nutritional program and, unless further amended, the initial fertilizer charge is not expected to last very long after planting. In most operational uses at nurseries, FAS is regularly supplemented with additional nutrients. Although FAS may be a useful nursery treatment, it may result in seedlings that grow faster and become taller than desired. Although the pelletization of fertilizers used in FAS makes application relatively easy, it also increases the difficulty of maintaining a uniformity of fertilization during container loading, particularly for small volume containers. With the advent of new or improved polymers and resins in slow release fertilizers (Oertli 1980), there is renewed interest in FAS.

Objectives

These seven final reports give the site-specific responses of several different FAP and FAS applications in different parts of the province. The trials were performed on five species over a wide range of site conditions, using several commercial fertilizers with different formulations, rates of application, and release characteristics. Final reports are usually produced after the first two to five years. These reports provide the detailed background to the summary of the GROMAX™ Regeneration Note (Scagel, *et al.* 1994). They provide the detail necessary for practicing silviculturists to better evaluate techniques to improve early plantation height growth performance on an ecosystem-specific basis. Other reports and updates on FAS and FAP will be produced periodically. It should be noted that these trials are not old enough for free growing assessments to be made. The interpretations made here focus on survival, height growth differences between treatments, and height growth variability.

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